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Center for Army Analysis

FORCE MODERNIZATION STRATEGIES (FORMOST I AND II)

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The Army invests in new systems to improve Army readiness and capabilities, but also to maintain the viability of systems. The Deputy Assistant Secretary of the Army (Policy and Procurement) asked the Center for Army Analysis to determine the minimum cost to recapitalize Army systems currently in inventory by the same type of systems or by the least modernized types currently produced and maintain a system's average age and current force structure levels. The average age of a system acts as a measure of viability. Analysis shows that of 35 fleets examined, 27 can meet the required replace refit, retire (R3) point. The budget shortfall required to meet the R3 point for all systems is approximately 16 percent and to maintain all systems at their current average age is 21 percent.

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FORCE MODERNIZATION STRATEGIES (FORMOST I AND II)

SUMMARY

THE PROJECT PURPOSE was to determine the minimum cost to recapitalize Army systems currently in inventory by the same type of system (or by the least modernized type currently produced) to maintain a system's average age and current force structure.

THE PROJECT SPONSOR was the Deputy Assistant Secretary of the Army (Policy and Procurement).

THE SCOPE OF THIS PROJECT was limited to six missions or categories of systems including aviation, combat vehicles, tactical vehicles, engineer/construction, missiles, and "other" systems. Each category has a set of fleets and within these fleets are individual systems. The years of analysis were fiscal year 2000 to 2014. The average age goals ranged from 10 to 25 years, which included all systems' current average ages as well as assumed replace, retire, and refit (R3) points. The study does not imply or support a particular age for a system's R3 point, instead it provides the effect of using different ages in terms of the cost to maintain a fleet at a chosen age.

THE MAIN ASSUMPTION was that all POM/EPP dollars were available to replace systems on a 1 for 1 basis with unrestricted procurement of current system or the least modernized currently produced. In effect this assumption produces a best case scenario for a recapitalization effort (cost lower bound).

THE BASIC APPROACH was to

(1) Modify the Force Modernization Analyzer Model (FOMOA) to address age in the objective function with appropriate constraints. The resulting model is a linear program with two competing objectives. The first objective minimizes the total amount of years that all systems exceed the age goal and the second objective minimizes cost using the first objective's result as an additional constraint.

(2) The first five categories provide data for a simulation that allow an estimate on the shortfall of funds for category six (other systems), which was not considered explicitly in the model.

(3) The effect of different R3 points on the resulting cost is examined with sensitivity analysis.

THE PRINCIPAL LIMITATION is that age is not necessarily the best criterion to reflect the capabilities or condition of a fleet. Other potential influences include miles, rounds fired, flight hours, and environmental conditions, which should be employed when data is available.

THE PRINCIPAL FINDINGS are

(1) The Combat Mission Category is the least capable category as far as maintaining their current average age or R3 point.

(2) Mission categories for systems may as a whole be over or short required funding; however, the individual fleets in the category are not necessarily all short or all over in funding.

(3) The chosen "age goal" has a significant impact on required funding.

(4) There is a need to determine if "age" (and/or other measures such as flying hours, OPTEMPO miles, rounds fired, …) should be used as a criterion (criteria) for the R3 point for selected Army fleets.

(5) Additional funding is required to maintain all systems at R3 point (16 percent) or their current average age (21 percent).

THE PROJECT EFFORT was conducted by LTC Bill Tarantino, Resource Analysis Division, Center for Army Analysis.

COMMENTS AND QUESTIONS may be directed to the Director, Center for Army Analysis, ATTN: CSCA-RA, 6001 Goethals Road, Suite 102, Fort Belvoir, VA 22060-5230

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1 INTRODUCTION

1.1 Background

This analysis is based on the premise that the Army needs to maintain the average age of their primary systems notwithstanding other factors or metrics that contribute to the overall readiness and operational effectiveness of these systems. FORMOST highlights budget issues that affect the Army's ability to meet this goal.

Given a force structure where the threat, Army needs, and other factors have been considered, what is the minimum cost to maintain the required fleet over the Program Objective Memorandum (POM)/extended planning period (EPP)? The analysis determines if there is a shortage of funds in the POM/EPP to adequately modernize the different Army system fleets and maintain the average life of each fleet.

The first force modernization study in 1988 used the FOMOA Model, which was spreadsheet-based and an offshoot of the PHOENIX Model (CAA-D-89-3, User's Manual for Force Modernization Analyzer (FOMOA) (Level 1) published November 1989).

Deputy Assistant Secretary of the Army, Policy and Procurement (SAAL-ZP) asked the Army Materiel Systems Analysis Activity (AMSAA) to evaluate potential models and determine if there was an analytical model that looked at the average age of Army fleets or if one had to be developed. AMSAA verified that the FOMOA Model provided a sound basis for such an analysis.

The Center for Army Analysis (CAA) demonstrated the FORMOST methodology in June 1999. The model maintains the procurement aspects of FOMOA; however, we changed the FOMOA model's objective to facilitate an analysis focused on the age of a fleet.

Initial FORMOST I results were reported on 30 August and the FORMOST II tasking was received on 9 September. Several additional short-term taskings were received and met prior to the culmination of the study on 15 November 1999. This document reports all results.

1.2 Purpose

FORMOST analysis determined the required funding level to recapitalize Army systems currently in inventory (does not purchase new systems) by the same type of system or by the least modernized type currently produced to *maintain the system's FY 2000 average age.*

FORMOST II expands FORMOST analysis to examine different age goals and determines the required funding levels to maintain the revised goal.

1.3 Assumptions

1. A system's economic useful life is approximately twice the R3 point (replace, refit, retire) (Information paper, DCSOPS, DAMO-FDR, May 1997).

2. All POM dollars for extension programs, upgrades, and new systems can be used for this case (guidance form SAAL-ZP).

3. All modifications are treated equally and replace systems on a one-for-one basis (guidance from SAAL-ZP).

4. R3 points:

Table 1. R3 Points

Fleet	R3 Point (Years)
Tanks/ Infantry Fighting Vehicles	8-10
SP Artillery	8-12
Helicopters	20
HMMWV	14
2 ½ Ton Trucks	20
5 Ton Trucks	22
HET	14
HEMTT/PLS	20

Assumptions 2 and 3 makes this a slightly optimistic analysis, thus the derived expected cost and budget shortfalls are lower bounds.

1.4 Key Limitations

This is a specific modernization case that limits itself to using existing systems or the least modernized systems as replacements, which tend to be the minimum cost systems. This leads to a lower bound estimate.

Age is not the only or necessarily the "best" criterion to reflect the capabilities or condition of a fleet, but age is understandable and usually available. Other potential influences include miles, rounds fired, flight hours, and environmental conditions, which should be employed when data is available.

Average age does not reflect the characteristics of a fleet's age distribution and does not by itself provide a complete evaluation of the systems in a fleet.

1.5 Scope

Mission categories for this analysis include aviation, combat vehicles, tactical vehicles, engineering and construction, missiles, and an "other" category that includes all POM/EPP systems not included in the five explicit categories. SAAL-ZP also tasked us to consider the cost impact on systems in Force Package I (see Appendix F).

We examine the FY 00-FY 14 POM/EPP and determine budget shortfalls if we vary system's average age from 10 to 25 years.

The sponsor added several questions to the project's scope concerning the reported age, the consistency of the model's inputs, and desired a comparison of results with the Office of the Secretary of Defense's (OSD's) analysis specifically for the CH-47.

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2 GENERAL METHODOLOGY

The general methodology for this project included:

1. Data collection and verification.

2. Run a linear program for each fleet of systems that minimizes the cost to maintain a fleet of systems at a certain half life, R3, or average age.

3. Run a monte carlo simulation to estimate budget shortfalls for fleets not explicitly modeled.

4. Conduct sensitivity analysis.

A flow diagram of the methodology is at Figure 1.

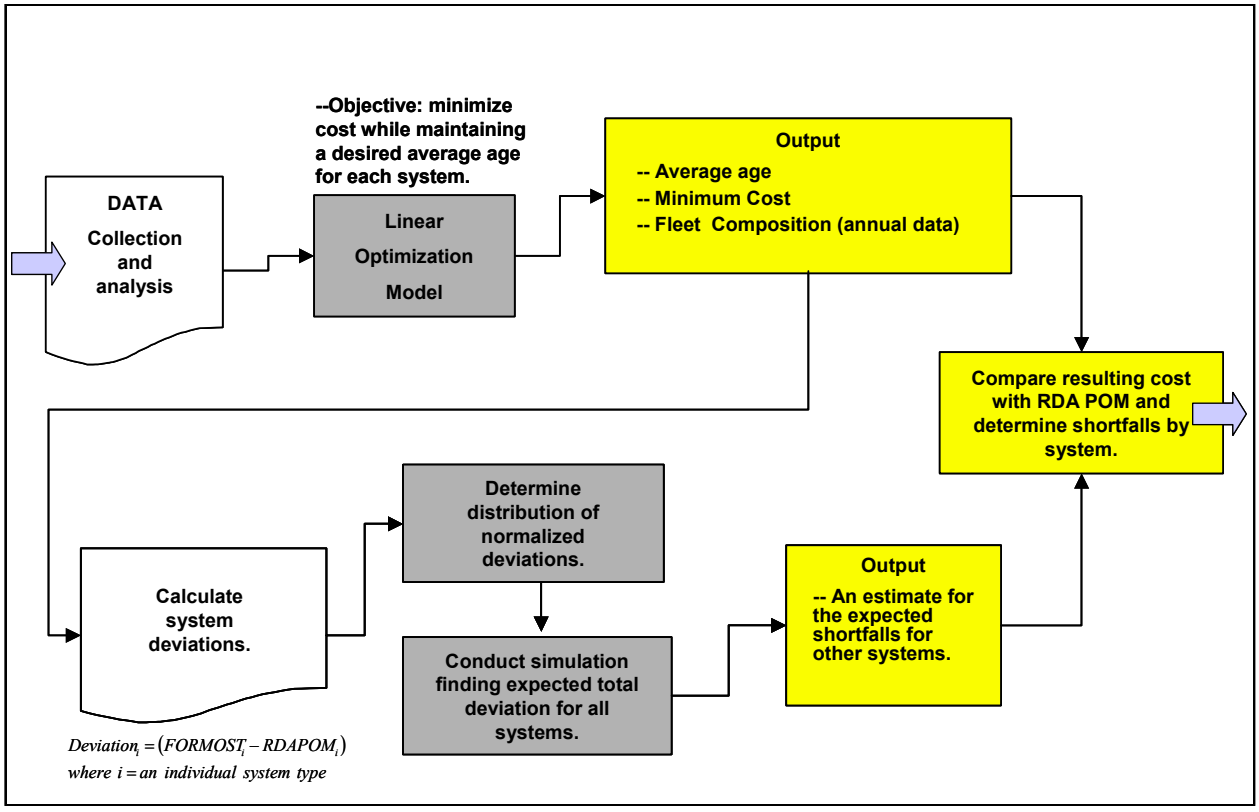


Figure 1. Methodology

The linear program model provided the minimum cost based on age and fleet composition information, while the simulation provided estimates for "other" systems. These outputs were then compared to the budget available for Army recap to determine shortfalls.

2.1 Definitions

1. Recapitalizing

Recapitalizing the force includes the replacement or refitting of selected aging systems to ensure operational effectiveness and to control operational costs. "Recapitalizing can be achieved through individual system replacement, extended service programs, preplanned product improvement (P3I), depot rebuild, or technology insertion." The objective is to "ensure mission essential systems do not exceed their refit, replace, or retire points."

2. System Structure

Throughout the analysis, a "system" refers to a particular major end item, for example an AH-64 attack helicopter is one system. A "fleet" is a group of similar systems, for example, the tank fleet has the M1A1, M1A2, M1A2SEP, and M1A2/Upgrade systems. A fleet can also be one system (i.e., the Avenger system). A "mission category" includes a number of systems and "fleets" of systems. For example, the aviation category includes the AH, UH, cargo, and scout fleets and each one of these fleets has its corresponding systems. Appendix E has a list of all categories, fleets, and systems.

3. Average Age

The average age of a system can be calculated using the inventory of the system (number of systems) and the year a system entered service, the ensuing calculation is straight forward.

$$\sum_{age}(\#systems * age) / total\ \#systems$$

Figure 2 provides the average age for all systems, the final average age realized in FY 14, and the maximum average age over the 14-year planning period given current production plans. We can see that the engineer/construction mission category is better off in FY 14, but the majority of other categories are worse off. Specifically, the tank, UH-series, infantry fighting vehicles (IFVs), and missile fleets all realize a higher average age in FY 14.

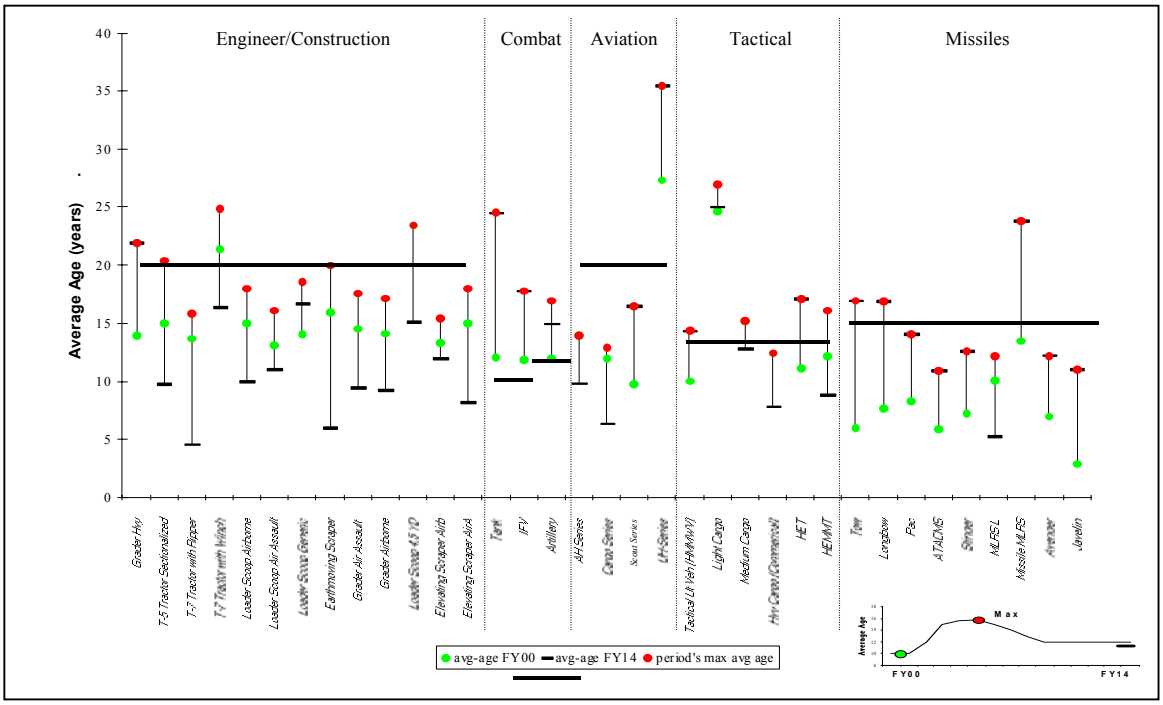


Figure 2. Average Age for Army Fleets FY00-FY14 with Current Production Plan

2.2 Model Overview - Introduction

FORMOST is a mixed linear programming model that determines the optimal system mix that minimizes the cost to meet an age goal for a fleet. The model has two objective functions. The first objective minimizes the increment over the age goal for a category over the period. The second objective minimizes the cost of maintaining an age goal given the value from the first objective as an additional constraint. The model is run for a minimum of five different age goals including the desired half-life/R3 point and solves using a personal computer and the GAMS software with OSL2 solver in less than 1 minute.

2.3 Data Inputs and Sources

1. System inventory by age (2000 baseline, Program Managers and SAAL-ZP).

2. Alternatives for each system and associated procurement costs (SAAL-ZP).

3. System production limits (SAAL-ZP).

4. System operation and maintenance (O&M) cost (2000 baseline, Army Cost and Economic Analysis Center).

5. Procurement and O&M cost escalation factors (estimates).

6. System requirements by year (Program Managers and SAAL-ZP).

2.4 Formulation

Model Description (FORMOST)

Indices

s System types
m Fleet under evaluation, each fleet m is a collection of systems s
y Time, in years, $y = \{0,\ldots,15\}$, corresponding to {FY 0,…,FY 14}
a Age, in years, $a = \{1,\ldots,50\}$.

Data

q_{sa} Starting inventory for each mission of system type s age a.
c_s Cost of producing one system type s in FY 00.
o_s Cost of operating and maintaining one system type s in FY 00.
g_s Growth factor for operating costs for system s.
p_s Growth factor for procurement costs for system s.
$\overline{PL}_{sy}$ Upper and lower ($\underline{PL}_{sy}$) production limits of system type in s year y.
$\overline{\overline{I}}_{my}$ Force requirements for fleet m in year y. This data can be further specified into systems required in year y. Or requirements by mission and year where we have upper and lower bounds on mission size: $\overline{MS}_{my}$ and $\underline{MS}_{my}$
$\overline{B}_y$ Upper bound on procurement budget for year y.
$\overline{\overline{B}}_y$ Upper bound on operating cost budget for year y.

Derived Data

A_{my} Current cumulative age of fleet m in the first year, FY 00. Where:
$A_{my} = \sum_{s \in m, a} (q_{sa}) a, \forall : m, y = 0$.

$\overline{a}_{my}$ Desired average age. Where the desired can be the current average age:
$\overline{a}_{my} = \frac{A_{my}}{\sum_{s \in m, a} q_{sa}}, \forall : m, y = 0$ **or** any chosen age can be designated in lieu of the current average age.

$\overline{\overline{a}}_{my}$ Cumulative age goal. Where $\overline{\overline{a}}_{my} = \overline{a}_{my} * \overline{\overline{I}}_{my}, \forall : m, y$.

C_{sy} Cost of producing one system s in year y. Where $C_{sy} = (1 + p_s)^y c_s, \forall : s, y$.

O_{sa} Cost of operating and maintaining one system s of age a. Where
$O_{sa} = (1 + g_s)^{(a-1)} o_s, \forall : s, a$.

Variables

P_{sy} number of system *s* procured in year *y*.
R_{say} number of system *s* of age *a* retired in year *y*.
I_{say} number of system *s* of age *a* in inventory in year *y*.
OV_y increment over average age for the fleet under investigation in year *y*.

Objectives: currently the model has two objective functions. The first objective minimizes the deviation from the given age goal for a given fleet.

$$OBJ\ 1,\ minimize\text{:}\ \sum_{y} OV_y \tag{0.1}$$

The model solves the first objective and then solves the second objective minimizing the total cost of maintaining the age goal for a fleet m, given the value of the first objective as an additional constraint.

$$OBJ\ 2,\ minimize\text{:}\ total\cos t = \sum_{s,y} P_{sy} * C_{sy} + \sum_{s,a,y} I_{say} * O_{sa} \tag{0.2}$$

Constraints:

Production limits ensure that the maximum and minimum production for any system over time is not violated.

$$\underline{PL}_{sy} \le P_{sy} \le \overline{PL}_{sy}, \forall : s, y \tag{1.1}$$

Mission size ensures that the number of systems the model is required to have in inventory is maintained.

$$\sum_{s \in m,a} I_{say} \ge \overline{\overline{I}}_{my}, \forall : y \tag{1.2}$$

Total age ensures that the sum of the age of the systems in the inventory is less than the total age allowed, based on the desired age goal and the minimum required inventory; any overage is captured by the OV variable. The model was originally designed to maintain the average age, however, there is no reason to limit analysis to the average. The analyst states the desired average age as a scalar in the user interface or picks an option to maintain the current average.

$$\sum_{s \in m,a} a * I_{say} - OV_y \le \overline{\overline{a}}_{my}, \forall : y \tag{1.3}$$

Budget constraints are added to the model when there is a specified budget versus the default of an unconstrained budget, and can be treated separately for production and operating costs.

$$\sum_{s} P_{sy} C_{sy} \le \overline{B}_y, \ \forall : y \text{ and}$$

$$\sum_{s,a} I_{say} O_{sa} \le \overline{\overline{B}}_y, \ \forall : y$$

Inventory constraints manage the inventories for production and retirements.

Inventory in year 1: $q_{sa} - R_{say} = I_{say}, \forall : s, a, y = 0$ (1.4)

Inventory new systems: $P_{s(y-1)} = I_{say}, \forall : s, y > 0, a = 1$ (1.5)

All other inventory: $I_{s,(a-1),(y-1)} - R_{say} = I_{say}, \forall : s, a > 2, y > 1$ (1.6)

All variable are positive: $I, R, P, OV \ge 0$ (1.7)

3 RESULTS

3.1 Results

Table 2 depicts the current average age, R3 point, and the number of fleets within the mission category that can meet the given age goal.

Table 2. Systems that Meet Age Goals

Category	Current AVG AGE	R3 Point	# of Fleets	age goal:	10	12	14	15	20	25
					Number of fleets that can meet the stated Age Goal					
Engineer/Construction	15.62	20	13		7	9	9	10	12	13
Combat Vehicles	11.97	12	3		1	1	2	2	2	3
Aviation	15.76	20	4		2	2	2	2	3	3
Tactical Vehicles	14.29	14	6		2	2	4	4	6	6
Missile	7.63	15	9		4	5	6	7	7	9
All	13.05	17	35		16	19	23	25	30	34
					(34.3%)	(48.6%)	(60%)	(65.7)	(82.9)	(97.1)

Of the 35 fleets, 27 of the 35 can meet the assumed R3 point (77%)
Combat Vehicles: R3 is 10 for Tanks, 12 for Artillery

The shaded cells under the age goal area correspond to the R3 point for the mission category. For example, the combat vehicles include tanks and artillery with R3s of 10 and 12, respectively; therefore, cells 10 and 12 are highlighted in the combat vehicle row.

Of the 35 fleets, 27 can meet the assumed R3 point, or 77 percent. All fleets can meet the 25-year age goal except for one fleet in the aviation category.

Table 3 provides the mission category's *estimated* cost of the current plan and the plans required to maintain the current average age and to maintain the R3 point.

Table 3. Estimated Cost of Current Plan ($B)

FORMOST II	Current Plan			Desired Age or R3 point	Costs			
	avg age FY00	FY14	period's max avg age		current plan	maintain avg-age	maintain R3 point	difference avg-R3
Eng/Const	15.62	11.57	19.03	20	$ 0.873	$ 0.518	$ 0.34	$ 0.18
Combat Vehicle	11.97	19.12	19.77	10/12	$ 23.948	$ 41.070	$ 51.53	$ (10.46)
Aviation	15.76	17.04	19.72	20	$ 32.734	$ 21.069	$ 20.71	$ 0.36
Tactical Vehicle	14.29	14.32	17.07	14	$ 15.941	$ 12.038	$ 12.66	$ (0.62)
Missile	7.63	13.74	14.51	15	$ 13.582	$ 30.855	$ 15.97	$ 14.89
All	13.05	15.16	18.02	13.80	$ 87.079	$ 105.551	$ 101.21	$ 4.34
				Shortfall:	all systems	21.21%	16.22%	
					less missiles	1.63%	15.98%	

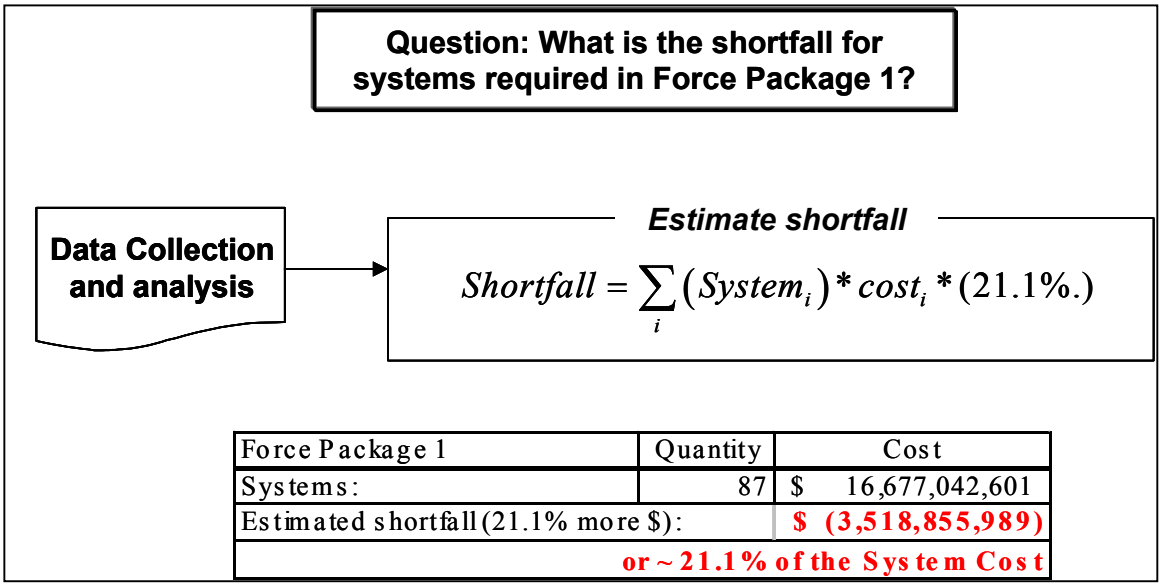
R3 for Combat Vehicles is 10 for Tanks and 12 for Artillery

For example, the engineer/construction expected cost under the current production plan is $873M, to maintain the average age the Army needs $518M, and to maintain the assumed R3 point the Army needs $340M.

The combat and missile system mission categories require additional funding to meet both their current average age and their R3 point, but the other mission categories require less funding. Overall, the total funding shortfall to maintain R3 across all missions is ~16 percent and for current average age ~21 percent.

The difference between the current average age required funding and the funding to maintain the R3 point is ~$4B, the majority of which is in the combat vehicles (requires less to maintain average age) and missile fleets (requires more to maintain average age).

3.2 Force Package 1 Result



Force Package 1	Quantity	Cost
Systems:	87	$ 16,677,042,601
Estimated shortfall (21.1% more $):		$ (3,518,855,989)
		or ~ 21.1% of the System Cost

Figure 3. Force Package 1 Result

The sponsor desired an estimate for the cost to maintain the current average age of all systems in Force Package 1. We find an estimate for the budget shortfall by taking the required number of a system from REQVAL and multiplying by the system cost and then multiplying by the expected shortfall from the prior result.

This shortfall is not based on POM procurements. We make the basic assumption that if we were to buy these systems in the FY 00-FY 14 time period, then, based on the prior specific systems analysis, we will be about 20 percent or $3.5B short of the dollars we need to keep these systems at the current average age (given the examined systems are representative of all other systems).

3.3 Sensitivity Analysis

Table 4. Army R3 Point and Half Life

A COMPARISON	FORMOST	OSD
Fleet	R3 Point	Half Life
Tanks/IFVs	10-12	10-15
SP Artillery	8-12	10-15
Helicopters	20	13-18
HMMWV	14	
2 ½ Ton Trucks	20	12.5
5 Ton Trucks	22	12.5
HET	14	12.5
HEMTT/PLS	20	12.5
	(Years)	

OSD keeps an estimate for the half-life of different Army systems; estimates corresponding to source systems we examine are listed in Table 4. Using ages that bracket the OSD Half Life listed in Table 4, we determine the impact on our estimates to meet a mission category's current average age and R3 and repeat our findings in Table 5. The average age cost is approximately equal to our prior estimate, the high range age provides a slight decrease in required funds to maintain the fleet at half-life, but requiring the low age increases the shortfall by almost 100 percent.

Table 5. Costs Using Different Half Life ($B)

	Costs using different Half Life			L-Avg-H
	Low	Average	High	
Eng/Const	$ 0.75	$ 0.75	$ 0.75	12
Combat Veh	$ 51.53	$ 41.29	$ 27.49	10-12-15
Aviation	$ 37.48	$ 30.02	$ 26.09	13-15-18
Tactical Veh	$ 15.56	$ 15.56	$ 15.56	12
Missile	$ 15.97	$ 15.97	$ 15.97	15
All	$ 121.28	$ 103.58	$ 85.85	
Shortfall:	39.28%	18.95%	-1.41%	

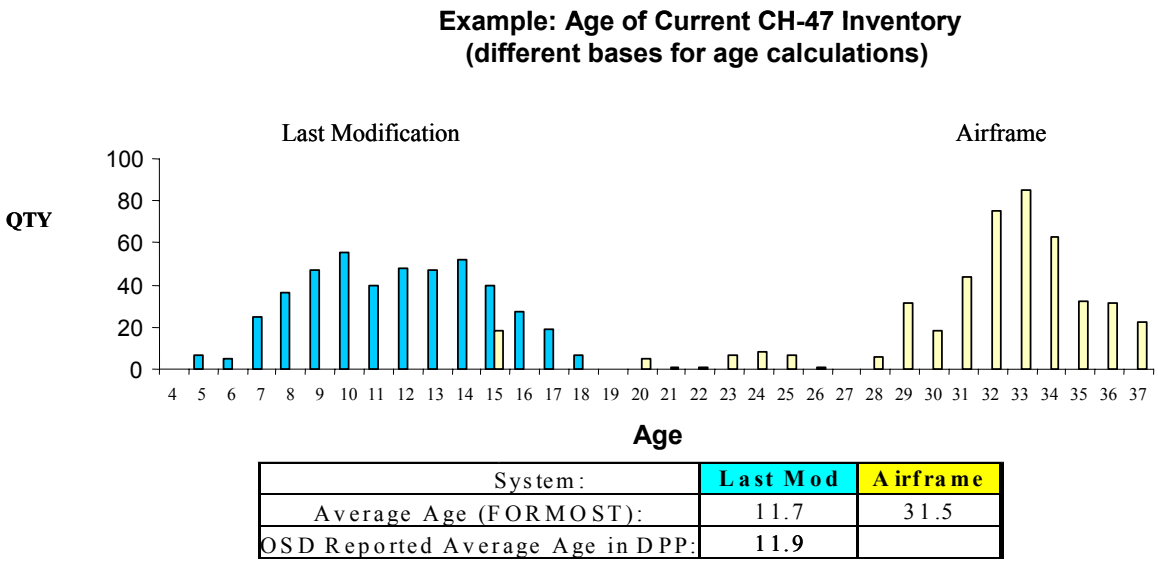
Through enumeration we determine the differences in required funds or costs to keep a mission category at a certain age goal. For example, the current aviation R3 is 20 years; if this goal deviates to 15, there is an additional budget requirement of ~$9B, but if the age deviates upward to 25 years, then the requirement decreases by ~$8B. The sensitivity of the requirement to the age goal differs between fleets and is dependent on the current inventory of the fleet. The calculated values are at Table 6.

Table 6. Age Difference Comparison

Age Goal:	10	12	14	15	20	25
	Difference in cost when R3 deviates from initial case (000)					
Eng/Const	$ 538,144	$ 407,011	$ 290,117	$ 233,064		$ (178,790)
Combat Vehicle	$ 11,057,226		$ (9,636,108)	$ (13,801,347)	$ (29,418,204)	$ (40,152,877)
Aviation	$ 24,093,127	$ 16,576,853	$ 11,414,540	$ 9,219,469		$ (8,170,858)
Tactical Vehicle	$ 7,009,110	$ 2,893,257		$ (1,235,508)	$ (6,298,674)	$ (9,937,528)
Missile	$ 13,466,268	$ 7,464,342	$ 2,327,589		$ (9,300,584)	$ (14,247,511)

	Percentage change from the current planned funding					
Eng/Const	0.618%	0.467%	0.333%	0.268%		-0.205%
Combat Vehicle	12.698%		-11.066%	-15.849%	-33.784%	-46.111%
Aviation	27.668%	19.037%	13.108%	10.588%		-9.383%
Tactical Vehicle	8.049%	3.323%		-1.419%	-7.233%	-11.412%
Missile	15.464%	8.572%	2.673%		-10.681%	-16.362%

3.4 Estimating Fleet Age: Two Methods



System:	Last Mod	Airframe
Average Age (FORMOST):	11.7	31.5
OSD Reported Average Age in DPP:	11.9	

These are the same aircraft. The age is calculated from two different points in time. "Last Mod" suggests a younger fleet.

Figure 4. Estimating Fleet Age: Two Methods

There are different methods that we can use to calculate the average age of a system. The differences in resulting age is most evident in the aviation systems. For example, in Figure 4, we have the current inventory of the CH-47 with ages calculated based on the "last modification" and by the aircraft's "mainframe" with the following result:

Airframe: the CH-47 frame's average age is about 32 years.

or

Last Mod: the CH-47's last recap was to the "D" model and has an average age of about 12 years.

Each method comes up with a different average age and results in a different funding requirement. CAA checked with OSD PA&E and found that they use the "Last Mod" method for the CH-47 and briefed the Defense Program Projection (DPP), with an average age for the CH-47 fleet at ~12 years. This age is consistent with the average age we used in the FORMOST II study.

The chosen method obviously has a direct impact on the reflected age of a system and the dollars required to maintain a given age goal. Figure 5 illustrates the different funding levels.

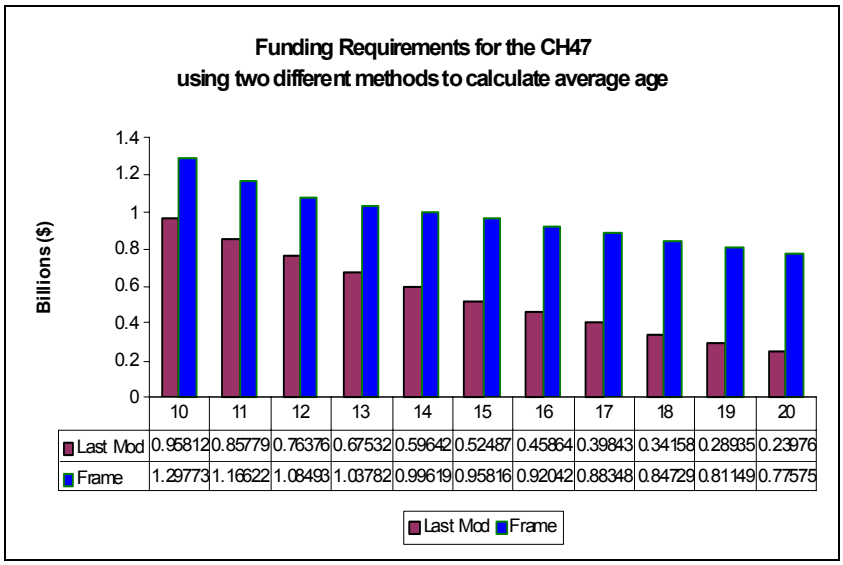


Figure 5. Funding Levels to Maintain Average Age of CH-47

It is intuitive that the lower the system's average age, the less funding the Army requires to maintain any particular age goal, and the lower the age goal the opposite is true.

4 FINDINGS

4.1 Funding Requirement

Average Age vs. R3: minimal difference in category requirements with the exception of missiles and combat vehicles. Combat category will require additional funding to meet age goals (current average or R3).

Other categories in addition to combat may be adequately resourced overall, but individual fleets may be short; for example, UH-series, high mobility multipurpose wheeled vehicle (HMMWV), and multiple launch rocket system (MLRS) missile planned inventories do not meet R3 goals by a wide margin.

The chosen "age goal" has a significant impact on required funding.

A need exists to determine if "age" (and/or other measures such as flying hours, OPTEMPO miles, rounds fired, …) should be used as a criterion (criteria) for the R3 point for selected Army fleets.

4.2 Recapitalization and Modernization

Budget requirements are sensitive to data inputs, mission options, and the age goal.

OSD uses ranges instead of an exact age for some systems' half lives.

The CH-47 result suggests that OSD uses the Last Mod method for calculating average age; however, we cannot currently confirm that the Last Mod method is used for all fleets.

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APPENDIX A PROJECT CONTRIBUTORS

1. PROJECT TEAM

a. Project Director

LTC William J. Tarantino, Resource Analysis Division

b. Team Members:

Dr. Robert Schwabauer
Ms. Linda LaBarbera

c. Other Contributors:

Ms. Kumud Mathur

2. PRODUCT REVIEWERS

Dr. Ralph E. Johnson, Quality Assurance
Ms. Tina H. Davis, Publications

3. EXTERNAL CONTRIBUTORS

R3/Half Life POCs

OSD PA&E, Force Planning Division
Army PA&E, Acquisition Support and program Analysis Division
PM Office for CH-47
ASA (ALT)
ODCSLOG-AVN
Chief DAMO-FDR
DAMO-FDV, CH-47 System Integrator
DSMC

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APPENDIX B REQUEST FOR ANALYTICAL SUPPORT

P ***Performing Division:*** RA ***Account Number:*** **99105**

A ***Tasking:*** Informal ***Method (Contract-Yes/No):***

R ***Acronym:*** **FORMOST**

T

Title: FORce Modernization Strategies

1 ***Start Date:*** 25-Jan-99 ***Estimated Completion Date:*** 30-Aug-99

Requestor/Sponsor (i.e., DCSOPS): ASAALT ***Sponsor Division:*** ZP

Resource Estimates: ***a. Estimated PSM:*** 6 ***b. Estimated Funds:*** $0.00

c. Models to be Used: **Modified FOMOA**

Description/Abstract: Develop and demonstrate a methodology to generate and evaluate procurement, modernization, and sustainment strategies to maintain the current (FY2000) average age for a set of Aviation, Ground Vehicles, Tactical Vehicles, and Engineer/Construction systems (Case I, Full Modernization). Once developed extend the study to include the procurement of the same or the next least modernized type of system the Army currently plans to produce (Case II, Mini-mod). Extend Case II to include Force Package I selected missile systems and explore the budgetary impact of other systems in general (Case III).

Study Director/POC Signature: ***Phone#:*** 703-806-5446

Study Director/POC: **LTC William Tarantino**

If this Request is for an External Project expected to consume 6 PSM or more, Part 2 Information is Not Required. See Chap 3 of the Project Directors' Guide for preparation of a Formal Project Directive.

Background:

P Sponsor requested a model to examine the average age of systems from AMSAA. AMSAA reviewed numerous models and determined that FOMOA was the most capable existing model that could look at average ages of systems.

A

R ***Scope:*** Review FOMOA and modify to review average age issues for Aviation, Ground Vehicles, Tactical Vehicles, and Engineer/Construction chosen systems.

T ***Issues:*** What is the cost to maintain the current average age for existing systems using current modernization plans? What is the cost of these systems in a mini-mod case (use only the same systems or the least modernized systems)? What are the implications on the cost for maintaining the average age for Force Package 1 systems?

2 ***Milestones:*** OCT 99 Brief results to Sponsor, OCT 00 Publish Report

Signatures ***Division Chief Signature:*** ***Signed and Dated*** ***Date:***

Division Chief Concurrence: ***Signed and Dated***

Sponsor Signature: ***Signed and Dated***

Sponsor Concurrence (COL/DA Div Chief/GO/SES): ***Signed and Dated***

PART 1

Performing Division: RA ***Account Number:*** **99151**

Tasking: Verbal ***Method (Contract-Yes/No):***

Acronym: **FORMOST II**

Title: FORce MOdernization STrategies II

Start Date: 09-Sep-99 ***Estimated Completion Date:*** 09-Dec-99

Requestor/Sponsor (i.e., DCSOPS): ASAALT ***Sponsor Division:*** ZP

Resource Estimates: ***a. Estimated PSM:*** 3 ***b. Estimated Funds:*** $0.00

c. Models to be Used: **FOMOA and MFOMOA**

Description/Abstract: In FORMOST, the model's modernization goal was to maintain the average age of a system over the extended planning period; however, during that study several other possible "goals" surfaced. In this QRA we determine the effect on procurement dollars of these different modernization goals (half life, shelf life, R3 point) on sponsor selected systems and the impacts of alternative force modernization strategies for these systems (full, mini-mod).

Study Director/POC Signature: ***Phone#:*** 703-806-5446

Study Director/POC: **LTC William Tarantino**

If this Request is for an External Project expected to consume 6 PSM or more, Part 2 Information is Not Required. See Chap 3 of the Project Directors' Guide for preparation of a Formal Project Directive.

PART 2

Background: Upon completion of FORMOST, the sponsor wanted CAA to expand the effort to look at different age goals.

Scope: Determine the cost of maintaining the average age of the system (taken from FORMOST), the R3 point, and other average ages (10,12,15,20).

Issues: What is the budgetary impact of maintaining different average ages for FORMOST systems?

Milestones: DEC 99 Brief results to Sponsor, DEC 00 Publish Report

Signatures ***Division Chief Signature:*** ***Signed and Dated*** ***Date:***

Division Chief Concurrence: ***Signed and Dated***

Sponsor Signature: ***Signed and Dated***

Sponsor Concurrence (COL/DA Div Chief/GO/SES): ***Signed and Dated***